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Fremau et al.

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(54) HYBRID TRANSMISSION FOR A MOTOR VEHICLE, AND CONTROL METHOD

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(56)**References Cited**

U.S. PATENT DOCUMENTS

7,979,704 B2 * 7/2011 Tsuboka G06F 21/445 8,585,522 B2 * 11/2013 Kaltenbach B60W 10/06 475/218

(Continued)

FOREIGN PATENT DOCUMENTS

DE 10 2006 003725 8/2007 EP 1 013 494 6/2000

(Continued)

OTHER PUBLICATIONS

U.S. Appl. No. 14/354,435, filed Apr. 25, 2014, Fremau, et al. (Continued)

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ABSTRACT (57)

A hybrid transmission for a motor vehicle including a heat engine and a driving electrical machine, including two concentric primary shafts, each of which includes at least one intermediate drive on a secondary shaft connected to wheels of the vehicle. The transmission includes a first mechanism for coupling the two primary shafts together, and capable of assuming at least three positions, of positions in which: the heat engine is separated from the drive train connecting the electrical machine to the wheels; the heat engine drives the wheels with or without the assistance of the electrical machine; and the heat engine and the electrical machine are coupled together to add respective torques thereof to the wheels.

12 Claims, 9 Drawing Sheets

